

TECHNICAL MEMO



To: Robert Vance PE, Gail Payne (City of Alameda)

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CC: Cheng Soo PE (WR), Erin Smith (City), Danielle Mieler (City), Dick Fahey (Caltrans)

Date: 1/19/2021

Subject: **DRAFT**
Alameda Northern Shoreline Adaptation Project – Existing Condition Needs

1 INTRODUCTION

The City of Alameda intends to apply for various grants for the Northern Shoreline Adaptation (NSA) project. The NSA project proposes to construct and/or enhance an existing seawall/levee that would protect properties and infrastructure in a current 100-year coastal flood event, including the Webster and Posey Tubes, and also would consider future means to protect the area against sea level rise.

NSA Project Goals

- Act as a barrier to the current 100-year coastal flood entry to the local streets, portals, tubes and State Route 260 on the Alameda side.
- Protect adjacent commercial and residential properties within the flood zone.
- Act as a barrier to a future 100-year coastal flood event assuming a moderate sea level rise scenario.
- Help the City move towards gaining Federal Emergency Management Agency (FEMA)-accreditation to enable the removal of the current flood zone in the northern shoreline area.
- Protect and enhance the San Francisco Bay Trail, waterfront access and other recreational and place-making opportunities such as nature-based adaptation solutions.

1.1 Purpose

The purpose of this memorandum is to document information to be used for grant applications and information needed to define and develop a conceptual (10%) design for the NSA project. This memo includes the following:

- Defines existing site conditions of and near the NSA project.
- Identifies feasibility issues and constraints to be considered for the NSA project.
- Identifies necessary additional information required to move forward with conceptual design of the NSA project.



2 EXISTING INFORMATION AND CONDITIONS

The following section discusses previous studies and documents relevant to the NSA project. These studies and documents contain information describing the City's overall strategy as defined in their Climate Action and Resiliency Plan (CARP), goals and concepts of the NSA project, construction and geotechnical information for the Webster and Posey Tubes, planned and recent site developments and improvements adjacent to the NSA project.

2.1 Previous Studies and Reports

Table 1: Previous Studies and Reports lists the documents collected and reviewed by Wood Rodgers for this project. The table is sorted by date from most recent to least recent.

Table 1: Previous Studies and Reports

No.	Data Type	Title	Date	By	Notes/Accompanying Files
1	Figure/Map	Northern Shoreline Conceptual 3D Wall	8/1/2020	City	Marked up map of Alameda marina
2	Figure/Map	Overall View of Wall and Flood Zone	8/1/2020	City	Floodwall alignment, contour lines, flood zone
3	Report	Alameda Groundwater Report	5/8/2020	City/Silvestrum	Analysis of emerging GW hazard + surfacing of known contaminants
4	Email Thread	Follow up	4/3/2020	City	Q/A about CARP
5	Tech Memo	Review of SLR at Oakland Alameda Access Project	3/3/2020	Wreco	Effects of SLR on Oakland Alameda Access Project
6	As-Built	Alameda Landing Shoreline Retaining Wall	11/04/2019	Simpson Gumpertz & Heger	Retaining wall details near tie-in of proposed seawall
7	Tentative Map	Alameda Landing Waterfront - Bay 37	10/17/2019	CBG	
8	Proposed Layout	Alameda Landing Waterfront - Bay 37	10/16/2019	CBG	
9	Report	Earth's Future	10/10/2019	Stammer et al.	High end study, links SLR to framework for policy and decision-making
10	Report	Climate Action and Resiliency Plan CARP	9/2019	City	Plan to mitigate effects of climate change
11	Timeline/Figure	CARP High level summary NS SLR	9/1/2019	City	Timeline of adaptation plan
12	GDB	City_of_Alameda_December_2019_GDB	9/1/2019	City	Different Rasters of emerging GW scenarios
13	Report	San Francisco Bay Shoreline Adaptation Atlas	4/1/2019	SFEI	Identify adaptation strategies to SLR
14	Tech Memo	City of Alameda Storm DMP CIP Update	12/5/2017	Schaaf and Wheeler	Additional CIP necessary to accommodate SLR
15	Investment Plan	Clement Avenue East Extension and Tilden Way	10/31/2016	City	Alameda CTC grant application example
16	Geotechnical Reports	Cardinal Point II, 2400 Mariner Square Drive	8/15/2013	LACO Associates	Geotechnical Report with soil data for Mariner Square
17	Report	Bridge Inspection Records Information	3/3/2005	Caltrans	Posey Tube as built
18	Geotechnical Reports	Aegis Assisted Living, Mariner Square Drive. Alameda: Foundation Investigation and Recommendations	3/12/2002	Lawrence B Karp	Geotechnical Report with soil data for Mariner Square



No.	Data Type	Title	Date	By	Notes/Accompanying Files
19	As-Built	7924P-23 1984 Webster St Tube South Wall record Drawings	4/18/1983	Caltrans	Drainage Details and Profiles
20	Design Drawing	2982-2988 Webster St Pump Station Record Drawings	2/1/1947	City	Webster St Pump outfall details

2.2 Climate Action Resiliency Plan (CARP) – Sea Level Rise and Flooding

The City of Alameda's Climate Action Resiliency Plan (CARP) was developed to address the current and imminent impacts of climate change on the island and its inhabitants. The plan's vision is to "adopt an integrated approach known as the 'Climate Safe Path,' which emphasizes reducing Green House Gases (GHGs) to achieve net zero carbon emission as soon as possible, as well as adapting the City to handle the climate change impacts experienced today." The most immediate impact from climate change with a significant consequence is from tidal flooding along the shorelines and low-laying areas due to sea level rise (Figure 1). The CARP has outlined several locations on Alameda Island that are vulnerable to flooding and what is being done to protect them. The focus of this technical memo is on projects '1-Shoreline at Webster and Posey Tubes' and "2-SR 260 and Posey/Webster Tubes". The City has developed the following Adaptation Plans for projects 1 and 2 as shown in Figures 2 and 3.

Figure 1: Vulnerable Locations in Alameda

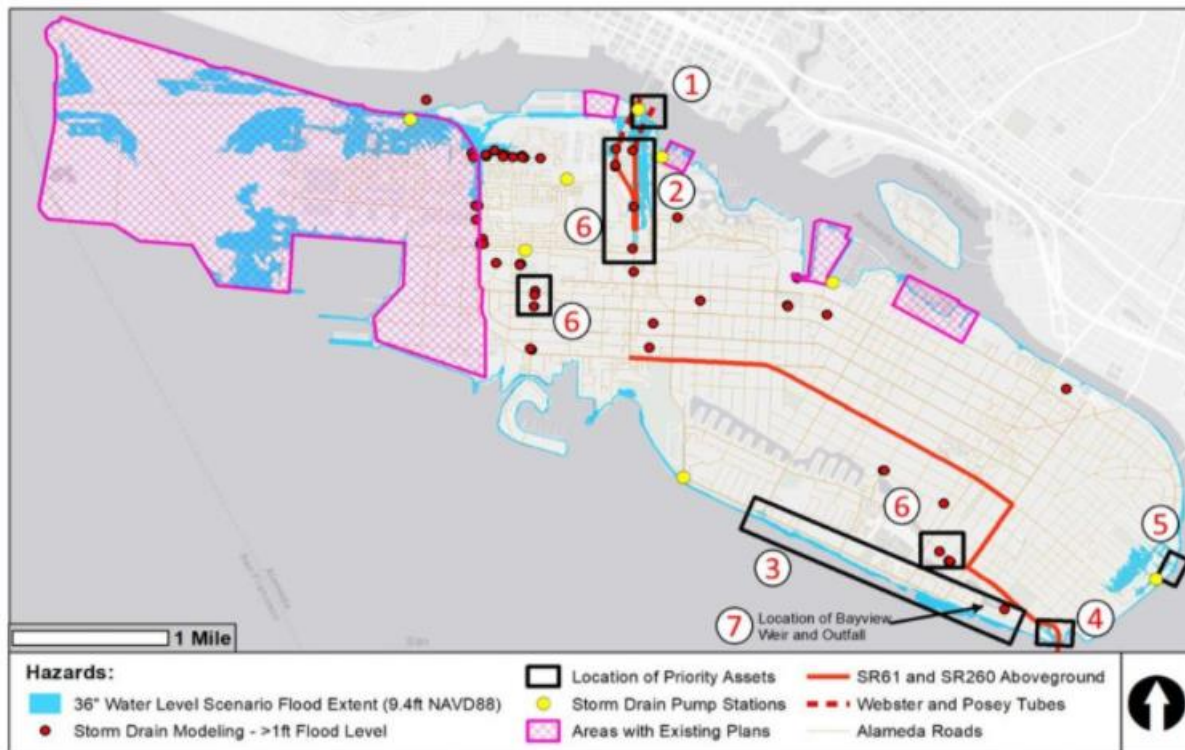


Figure 2: Adaptation Planning: Shoreline near Webster and Posey Tubes

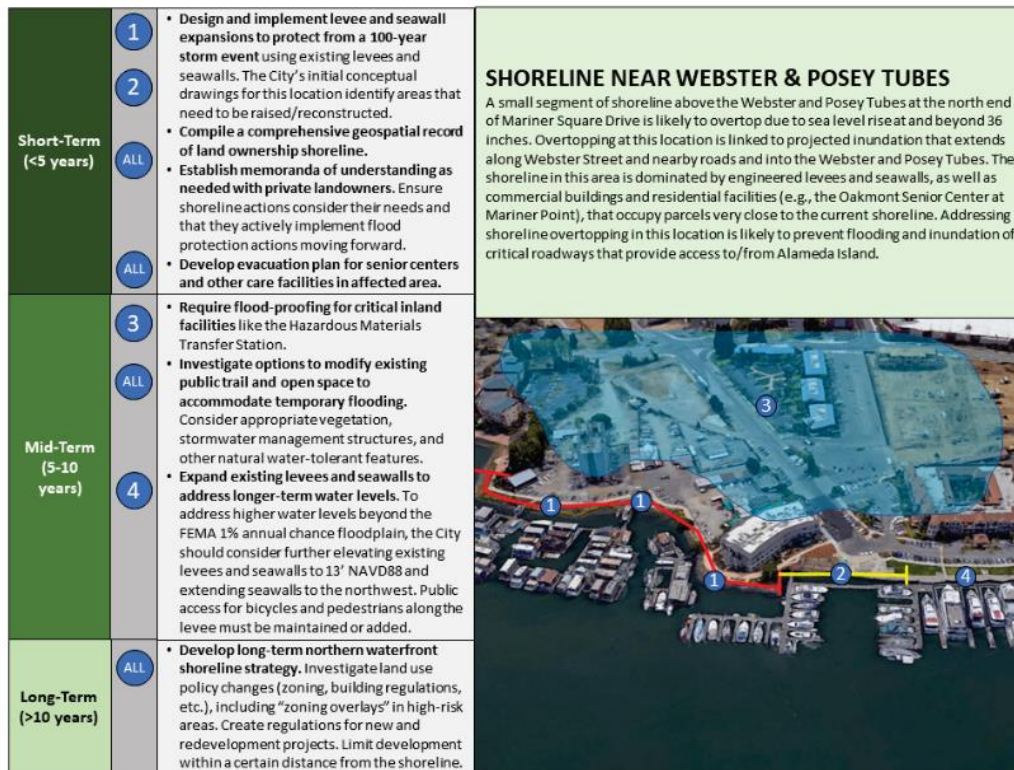
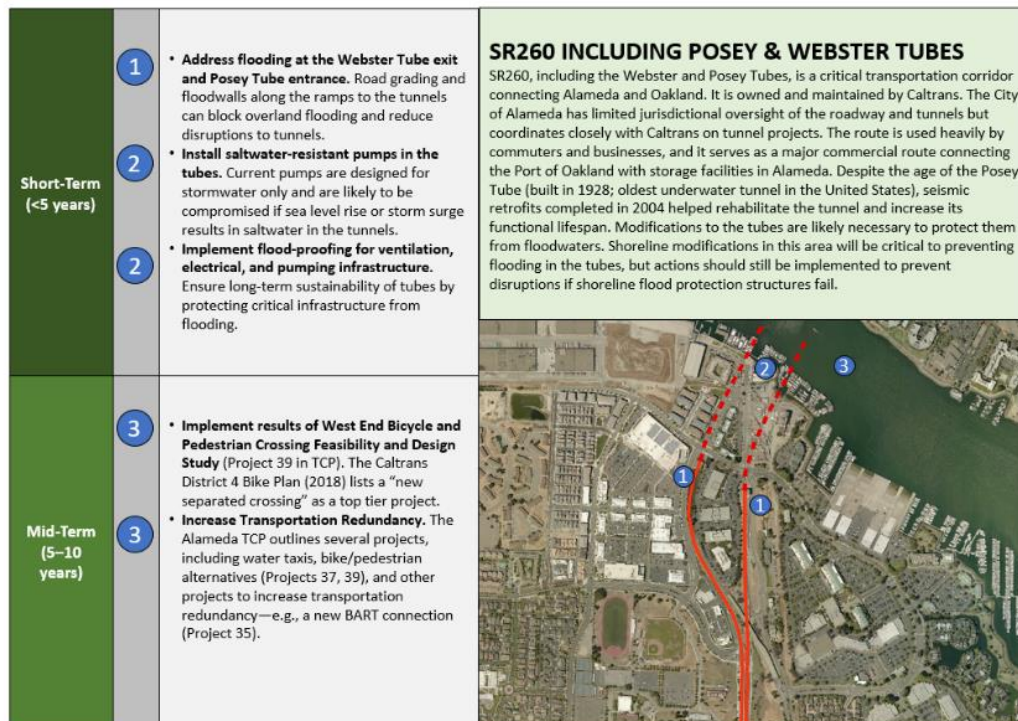


Figure 3: Adaptation Planning: SR 260, Including Posey and Webster Tubes

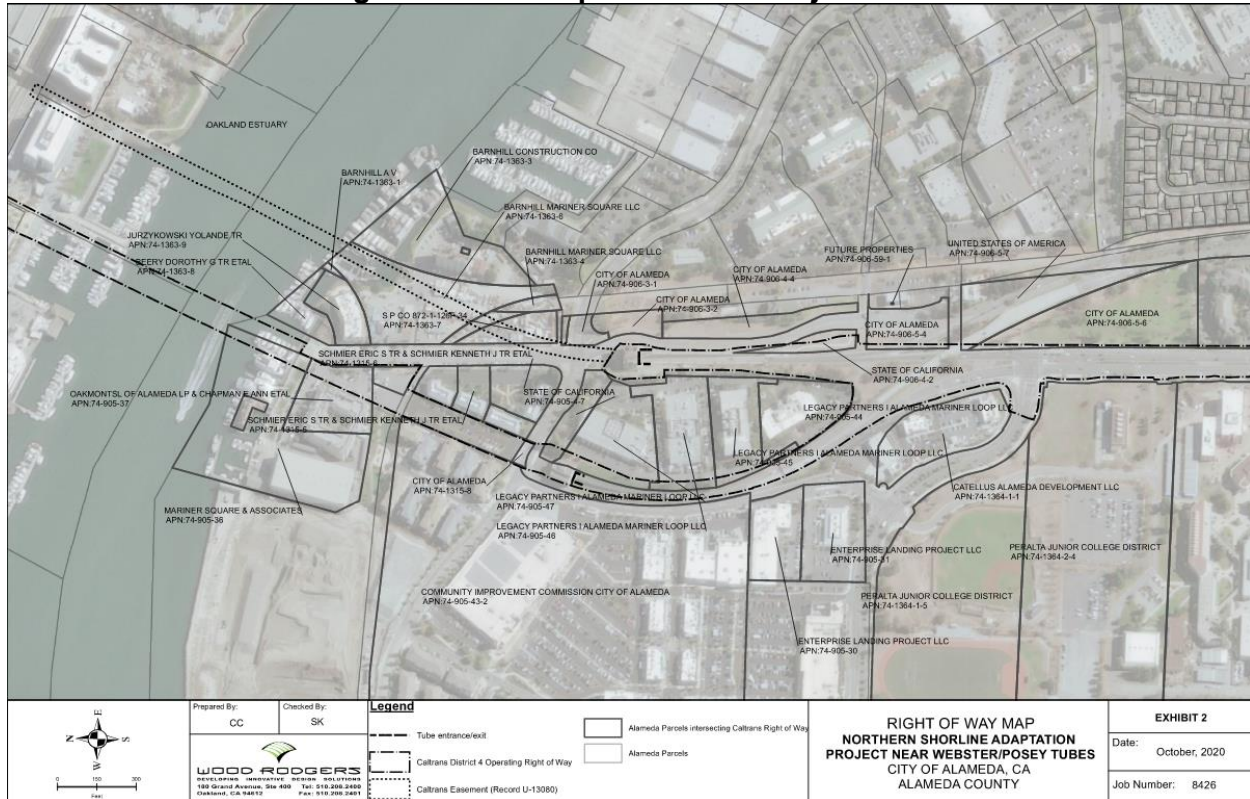




2.3 Base Map of the NSA Project Area

A base map was developed for the proposed NSA project site (Figure 4). This map shows parcels, Caltrans right of way and easements, and also the Posey and Webster Tube entrances.

Figure 4: Base Map of the NSA Project Area

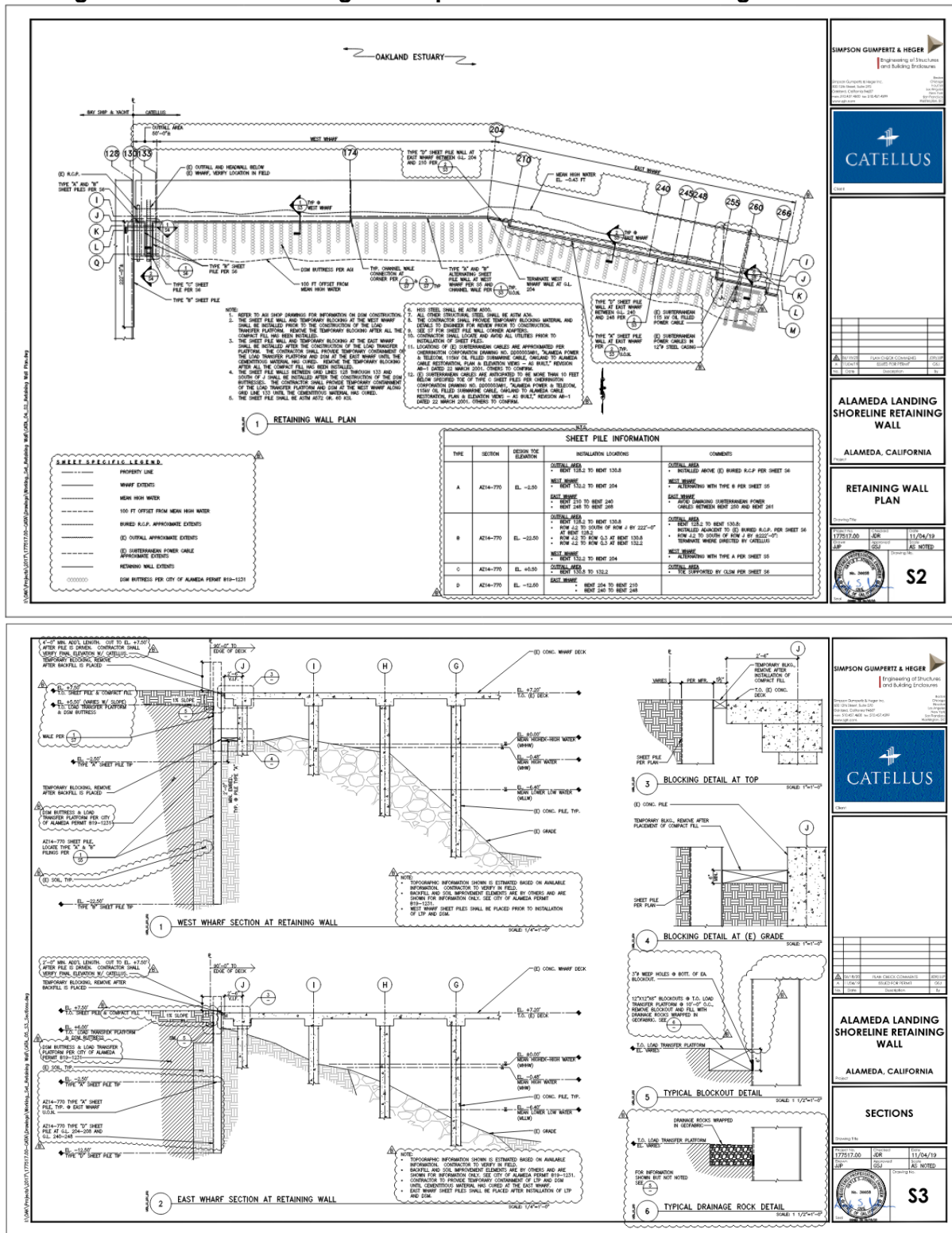


2.4 As-Built Plans

Several as-built plans were collected and reviewed to help define the proposed seawall design considerations and constraints around existing features. In particular, recent development plans for the Alameda Landing area as well as the plans for the Posey and Webster Tubes were reviewed. The Alameda Landing project includes an improved shoreline wall northwest of the NSA project, which could be tied into for contiguous projection (Figure 5). The Caltrans plans were reviewed to guide geotechnical and structural constraints for any proposed designs above the tubes. Screenshots from both plan sets are presented below. The Alameda Landing Shoreline Plans show a top of wall elevation = 13.3' NAVD88 (Figure 5).



Figure 5: Alameda Landing Development – Shoreline Retaining Wall As-BUILTs



The ground elevations at the shoreline crossings of the Caltrans Webster and Posey Tubes are approximately 9.5 feet and 9.0 feet NAVD88, respectively, and the top of tube elevations for the

Figure 6: Caltrans Posey and Webster Tubes





2.5 Field Visit

A field visit was conducted in January 2021 along the shoreline from Mariner Square Marina to Marina Village Yacht Harbor within close vicinity to the proposed project alignment to collect site photos (Figure 7). Several project constraints were identified such as utility conflicts, land ownership and right of ways limitations, access points to existing homes and docks, and considerations for the adaptation plan in regards to sea level rise. Issues related to these topics are discussed in more detail in Section 3 of this document. A photo log of the site visit is provided as an attachment to this memo.

Figure 7: Location Map for Photos Collected (January 2021)



Mariner Square Marina (Photo ID #5)



Shoreline at Extended Stay Hotel (Photo ID #38)



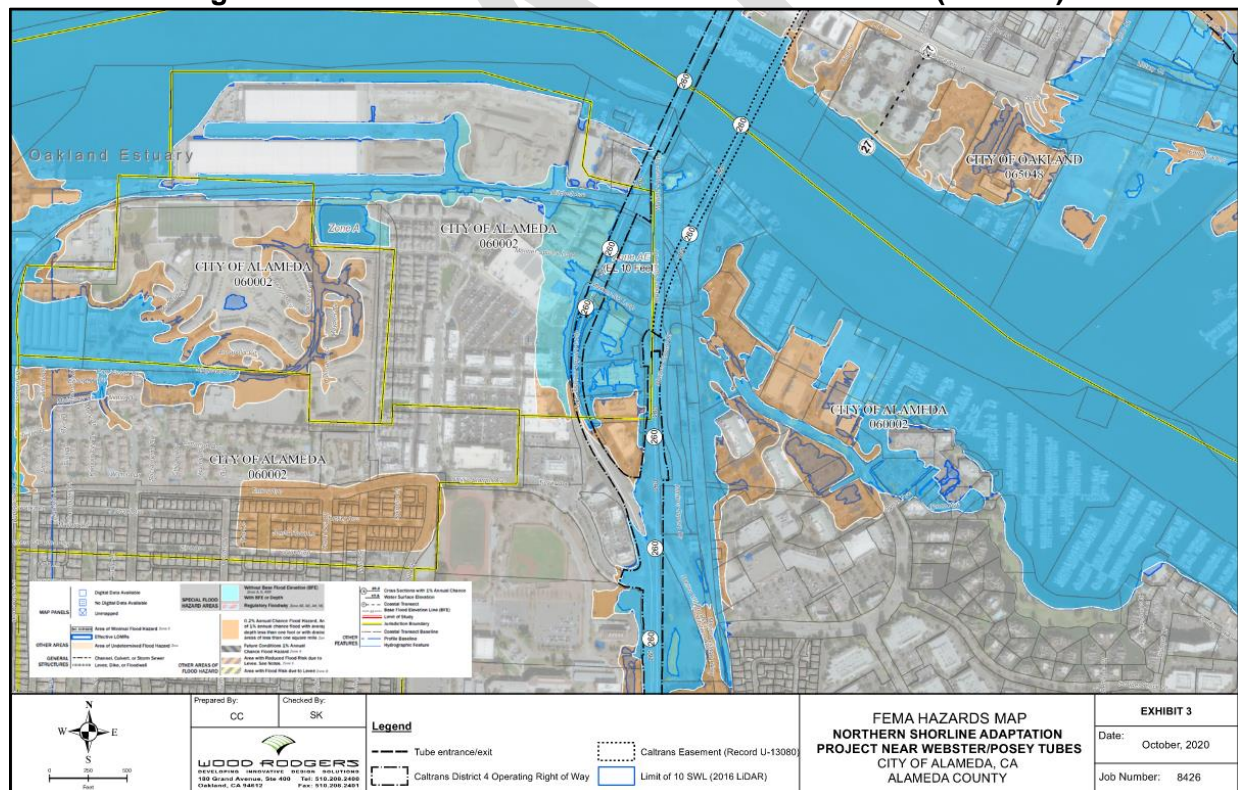
Near Marina Landing (Photo ID #84)



2.6 FEMA Current Effective 2018 Flood Hazards (1% AEP)

The FEMA Current Effective Flood Hazard Map is shown in Figure 8. This flooding is based on the 1% Annual Exceedance Probability (1% AEP) of the Still Water Level (SWL) in the estuary, meaning the SWL has a 1 in 100 chance of being equaled or exceeded in any 1 year, and the resulting flooding is possible. The blue area in the map represents the 1% AEP flood hazard zone from a SWL = 10 ft.

Figure 8: FEMA Current Effective 2018 Flood Hazards (1% AEP)

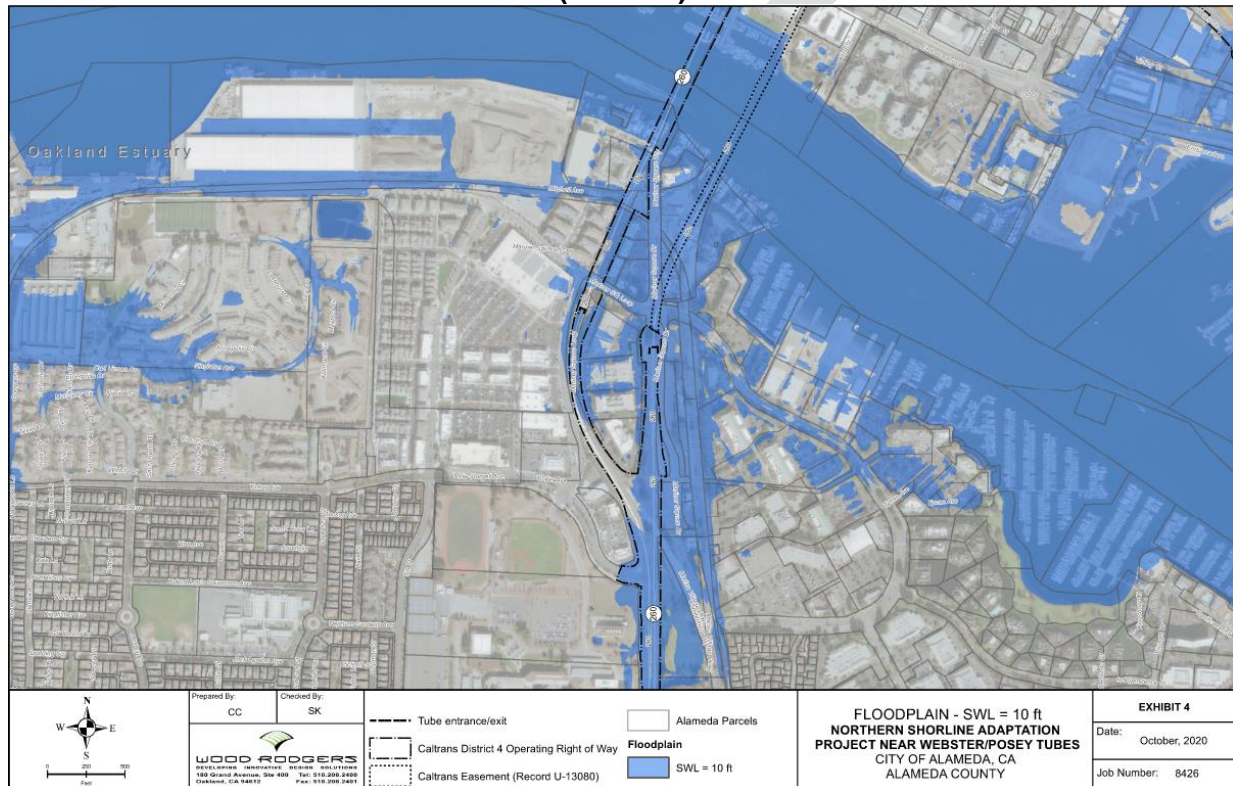




2.7 Existing Floodplain Remapped with Updated Topography (LiDAR 2019) (1% AEP)

In recent years several site developments and improvement projects have been constructed near the NSA project area. Recent site grading has raised the ground surface compared to the ground surface data used by FEMA in the Current Effect Map. Therefore, the SWL used in the FEMA maps should inundate less area if mapped using recent topography reflecting grading changes. Figure 9 shows the approximate 1% AEP flood hazard zone for SWL = 10 feet using LiDAR surface data collected in 2019. The floodplain near Alameda Landing shopping center is now above the flood hazard.

Figure 9: Existing Floodplain Remapped with Updated Topography (LiDAR 2019) (1% AEP)

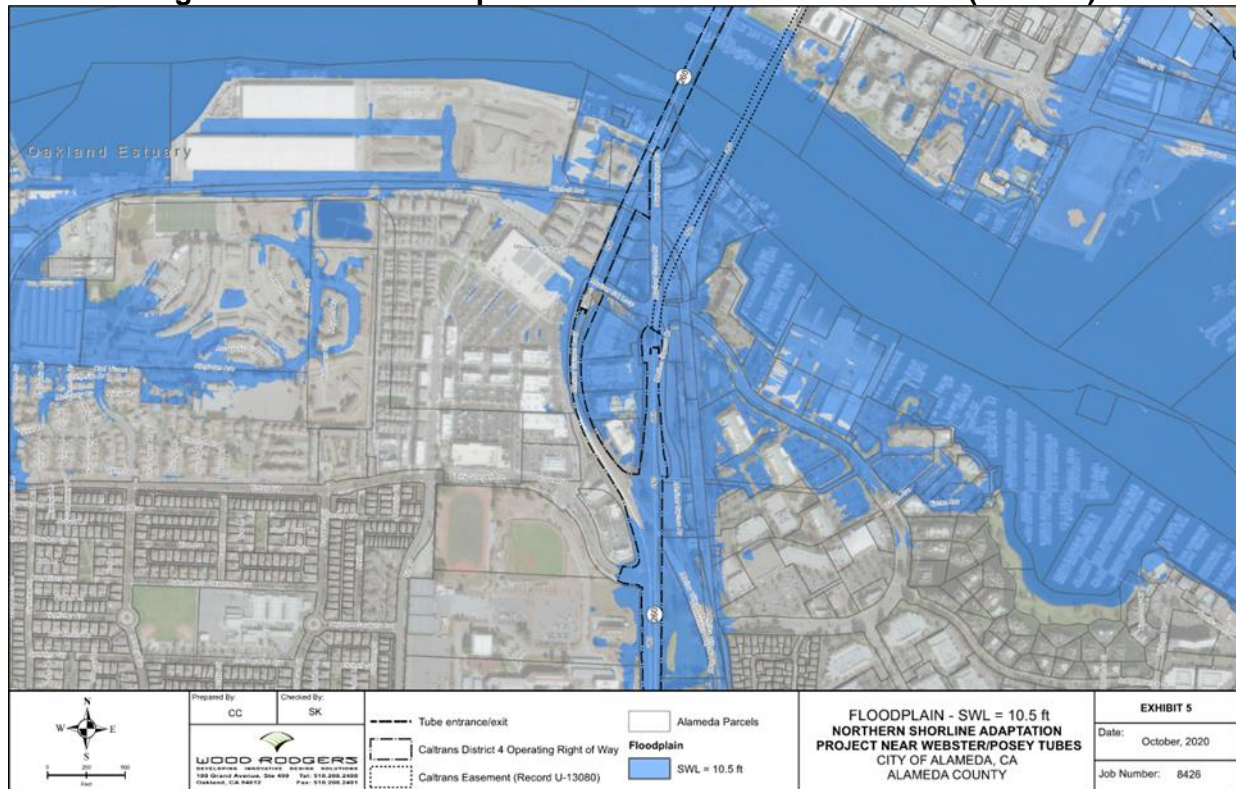




2.8 Future Floodplain with Sea Level Rise = 0.5 feet (1% AEP)

The approximate flood hazard with incremental sea level rise is shown in Figure 10. This map represents 0.5 feet of sea level rise above the SWL = 10 feet inundation.

Figure 10: Future Floodplain with Sea Level Rise = 0.5 feet (1% AEP)

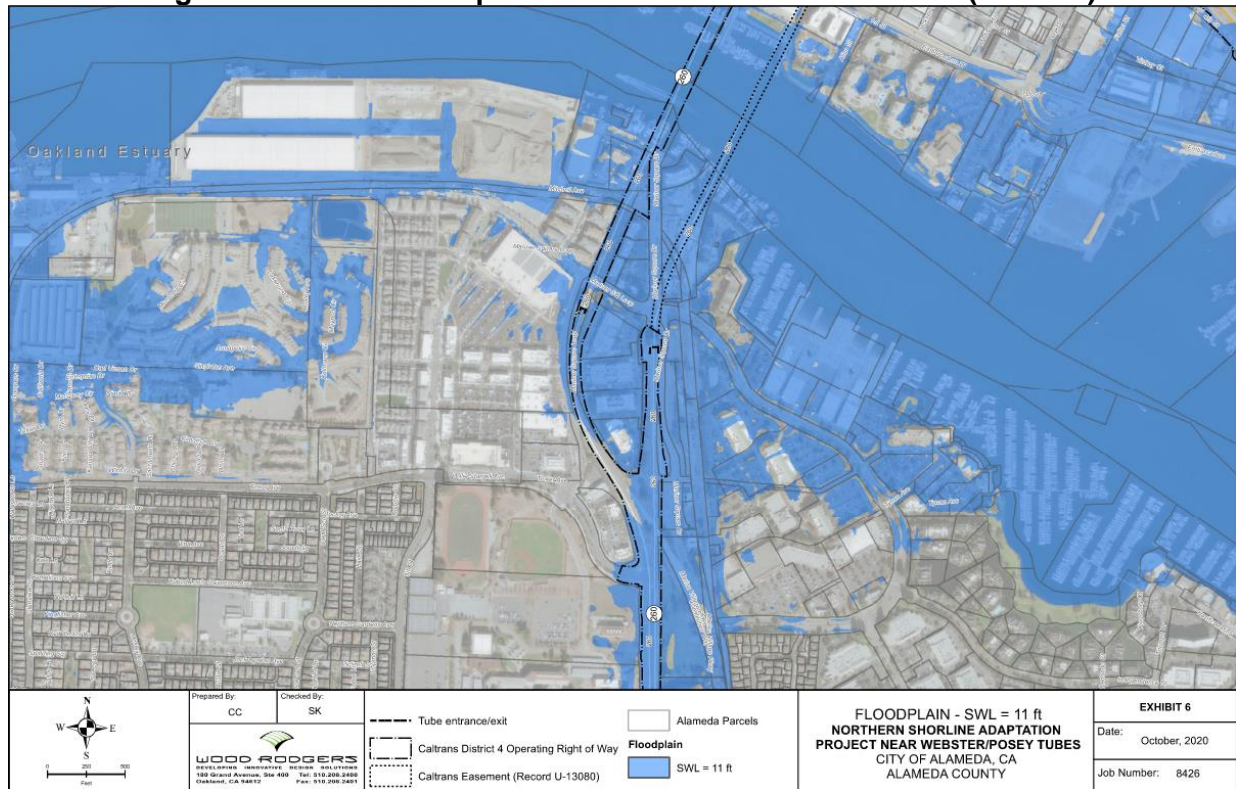




2.9 Future Floodplain with Sea Level Rise = 1.0 feet (1% AEP)

The approximate flood hazard with incremental sea level rise is shown in Figure 11. This map represents 1.0 feet of sea level rise above the SWL = 10 feet inundation.

Figure 11: Future Floodplain with Sea Level Rise = 1.0 feet (1% AEP)

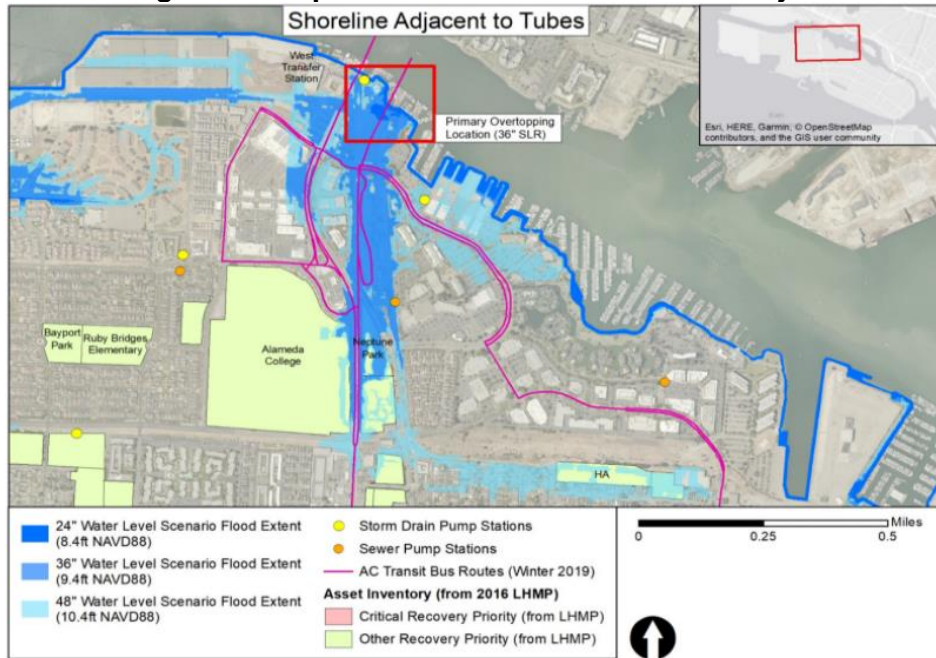




2.10 Transportation

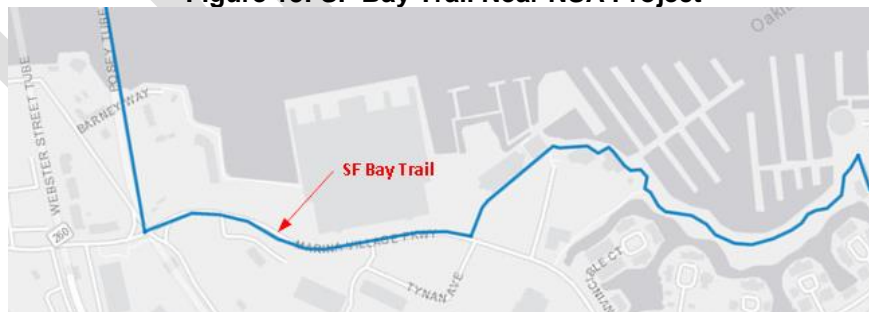
The City has developed a detail map showing floodplains, traffic impacts and other considerations for projects 1 and 2 shown below (Figure 12).

Figure 12: Impacted Bus Routes Near NSA Project



The Posey and Webster tubes are one of the main connections points to the City of Oakland and are also heavily used by multiple AC Transit bus lines including Lines 19, 20, 51A, 96, O and W. The closure of the tubes due to tidal flooding would have several large impacts to transportation to and from the City of Alameda and near the northern shoreline.

Figure 13: SF Bay Trail Near NSA Project



The San Francisco Bay Trail shown in Figure 13 is also near the NSA project area and is heavily used by residents and the community.

2.11 Geotechnical

See attached Geotechnical Memorandum by Cal Engineering and Geology (CE&G)

3 FEASIBILITY AND CONSTRAINTS

The following sections discuss feasibility issues, site constraints and other constraints to be considered for this adaptation project. Selected photos that represent typical design constraints and constraints relating to constructing along the shoreline are shown below.

3.1 Utilities

Several locations along the northern shoreline have multiple utilities anchored to the existing sea wall which are used as fuel lines and service lines to docks, boathouses, and for power distribution. In addition to smaller service utilities, a couple major facilities exist along the shoreline including the EBMUD interceptor, the Webster pump station and forcemain, and large stormdrain pipe outfalls.

Construction around these utilities can be difficult, especially when several small utilities are present in a small area. Not all underground utilities are identified or located which may also pose design or construction constraints.

Service lines to docks (Photo ID #8)



Fire pumps/water lines (Photo ID #12)



Power utilities near shoreline (Photo ID #6)



Webster Pump Station (Photo ID #15)



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3.2 Access and Ownership (ROW)

Several locations along the northern shoreline provide access to docks, boathouses, and commercial businesses. Some of the access points are privately owned or provide access to privately owned land and the City of Alameda would need to obtain easements or memos of understanding to facilitate a project across these locations.

Access to docks and boathouses (Photo ID #25)



Boat ramps private property (Photo ID #61)



3.3 Construction

Construction near the shoreline around large (storm) facilities and near structures on docks present some permitting and construction challenges.

Storm pipe outfall (Photo ID #72)



Structures supported by piers (Photo ID #71)





3.4 Project Alignment

There are a few locations along the shoreline where high ground is above elevation 14 (which is the intended top of wall elevation) and could to be utilized for tie in locations for a floodwall. However, since some of the locations are inland of the San Francisco Bay Trail, ending a floodwall at the high ground would leave the Bay Trail unprotected. If unprotected (and unimproved) the Bay Trail would experience temporary closures during extreme high tide events. Closures may occur more frequently with future sea level rise, and a complete loss of facility is possible in the future.

One of the NSA project goals is to maintain access and use of the San Francisco Bay Trail so it is recommended the project alignment be on the shoreline to maintain access to the Bay Trail. Protection at the shoreline will also help avoid managed retreat. If an inland protection alignment is then feature not protected should be improved (raised) to avoid inundation from sea level rise.

High ground inland (right side) of SF Bay Trail (Photo ID #70)



3.5 Flood Control

Changes in the still water elevation (the 1% AEP tide elevation) over time due to sea level rise present some challenges to flood control in regards to project adaptability particularly with respect to top of wall elevation. Setting a project alignment is also challenging if existing high ground is to be used in some areas instead of continuous shoreline protection from a levee or floodwall. The top of wall elevation requirements may change as sea level rise projections are updated in the future with better data and models. Thus, the proposed protection feature should be able to accommodate several (or one overly conservative) sea level rise condition. If high ground is to be incorporated into the protection feature for floodwall tie-ins for example, the location of high ground may be far enough from the shoreline to necessitate realignment of the protection feature inland or additional setback features to provide continuous flood protection. Flood control criteria for the protection feature will be documented in basis of design report.

3.6 Transportation

In addition to the traffic impacts outlined by the City CARP in Section 2.10, the following considerations also should be considered during planning and construction of the NSA project. Any construction within



the Caltrans ROW may require permits or a Project Study Report – Project Development Support (PSR-PDS) document, and will require coordination with Caltrans.

Construction near the tubes may require significant detours and delays impacting daily traffic to and from Oakland, Emergency Response vehicles and services, bus routes and pedestrian traffic. There can be significant costs resulting from these detours and travel time delays.

Construction near the shoreline would need to accommodate access and use of the San Francisco Bay Trail.

3.7 Geotechnical

See the attached Geotechnical Memorandum by Cal Engineering and Geology (CE&G) for a detailed discussing of the historic and current geotechnical considerations and constraints for the NSA project.

3.8 Permitting

Permits for the NSA project from Caltrans, the Bay Conservation Development Commission, and other agencies may be needed depending on the type and location of proposed construction. This will be further defined once the improvement project is further refined.

3.9 Nature Based Solutions

Nature based solutions are feasible at several locations along the NSA project alignment where the natural shoreline exists (not at location where wall is currently present). The City can mitigate coastal flooding by investing in nature-based shoreline stabilization. Living shorelines, reefs, and dunes can slow waves, reduce wave height, and reduce erosion. At the same time, these practices benefit the ecosystem by filtering and cleaning water and providing habitat.

3.10 Conclusions

The main feasibility and constraints for the NSA project have been identified and are listed in below.

- Maintaining access to docks and private property
- Utility conflicts near the shoreline and potentially underground
- Providing protection across private property or ROW
- Difficulty of construction in certain locations due to site layout and existing facilities
- The need for complex setback floodwalls or protection features if the project alignment is not along the existing shoreline
- Flood control top of wall adaptability for variations in SLR estimates
- Transportation studies required by Caltrans
- Detours for construction near Webster/Posey tubes and cost due to detours
- Soil settlement, seepage potential, and seismic concerns from existing site bay mud and proximity to the shoreline
- Permit requirements from BCDC and others



4 ADDITIONAL NEEDED INFORMATION

The following section lists topics and information that need further understanding to complete the analysis, design and construction of the shoreline protection project.

4.1 Topography

Existing ground topography survey along proposed improvement (seawall) alignment is needed to better define tie ins, seawall/levee sizes (heights and footprints) and cost of the proposed project.

4.2 Utility Locations

Surveyed utility locations are needed. This is also potentially needed for underground utilities near the proposed protection feature depending on the proposed improvement (seawall or levee).

4.3 Geotechnical

Geotechnical investigation and testing along the proposed shoreline project is needed to better define settlement potential and to help estimate design of the structure such as pile depth requirements, expected consolidation, and seepage potential.

4.4 Caltrans Requirements

A determination from Caltrans whether they will require the City to provide a PSR-PDS document since the Webster and Posey tubes will be crossed by the proposed shoreline protection feature but are considerably low (top of tube elevation is approx. 40 feet below existing ground and should not be impacted by above and below ground improvements).

4.5 Permits

A determination from governing agencies will be needed for construction near the shoreline and if there are certain thresholds that can be identified and avoided to reduce permitting requirements.

4.6 Transportation Impacts

Transportation impacts to daily commuter traffic, buses and public transit, the San Francisco Bay Trail, emergency response services, and vehicle and pedestrian traffic need to be determined and cost estimated for delays and detours.

4.7 EBMUD Interceptor Replacement Impacts and Coordination

An assessment of impacts and coordination with EBMUD will be needed for the planned 24" Alice-Webster EBMUD critical pipeline interceptor and removal of existing 16" interceptor.

4.8 Community Outreach

City staff and the consultant team will need to reach out to adjacent community members to ensure the final concept is appropriate and also will need to seek approval from City commissions, boards and the City Council.